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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/521,311

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EXAMINER

WARREN, MATTHEW E

ART UNIT

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2815

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/521,311	Applicant(s) WATANABE ET AL.	
	Examiner Matthew E. Warren	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-71 is/are pending in the application.
- 4a) Of the above claim(s) 38-71 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/4/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to the Remarks filed on February 4, 2008.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 10- 26, and 31-37 are rejected under 35 U.S.C. 102(e) as being anticipated by Jeon et al. (US 6,586,349).

In re claim 1, Jeon et al. shows (fig. 1) a semiconductor device comprising an insulating film structure (110) which electrically insulates a conductive region (108) from a silicon region (102), wherein said insulating film structure extends on said silicon region and under said conductive region, said insulating film structure further comprising at least one silicate region composed of a silicon oxide containing at least one metal element (col. 10, line 58- col. 11, line 5).

In re the remaining limitation of the claim, concerning the one metal element being thermally diffused, the limitation is a “product by process” limitation. A “product by process” claim limitation is directed to the product per se, no matter how actually made, In re Hirao, **190 USPQ 15 at 17**(footnote 3). See also in re Brown, **173 USPQ 685**: In re

Luck, **177 USPQ 523**; In re Fessmann, **180 USPQ 324**; In re Avery, **186 USPQ 116** in re Wertheim, **191 USPQ 90** (**209 USPQ 254** does not deal with this issue); and In re Marosi et al, **218 USPQ 289** final product per se which must be determined in a “product by, all of” claim, and not the patentability of the process, and that an old or obvious product, whether claimed in “product by process” claims or not. Note that Applicant has the burden of proof in such cases, as the above case law makes clear. “Even though product-by- process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process.” In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

In re claim 2, the limitations are “product by process” limitations. See the explanation above concerning a “product by process” claim limitation.

In re claim 10, Jeon shows (fig. 1) that the silicon region comprises a silicon substrate (102), the conductive region comprises a gate electrode (108), and said insulating film is a gate insulating film (110).

In re claims 11, 16, and 17, Jeon discloses (col. 5, TABLE 1) that the metal element is selected from the group listed in the claim.

In re claims 12-15, and 18-21 the limitations are “product by process” limitations. See the explanation above concerning a “product by process” claim limitation.

In re claims 22-24, as stated above, Jeon discloses embodiments (such as fig. 2) wherein the insulating film comprises first and second silicates. The limitations of the metal element being thermally diffused are “product by process” limitations. See the explanation above concerning a “product by process” claim limitation. The silicon containing insulator is a standard-k material and may contain the materials listed in the claims (col. 10, lines 20-37).

In re claims 25 and 26, Jeon discloses (col. 16, lines 1-15) that the cap layer may have the thickness described in the claims since the thickness of any sublayer may be 5 Angstroms (equal to 0.5 nm).

In re claim 31, the limitations are “product by process” limitations. See the explanation above concerning a “product by process” claim limitation.

In re claims 32 and 33, Jeon discloses (col. 10, lines 20-37) that cap region is a standard-k material and may contain the materials listed in the claims. Jeon also discloses (col. 16, lines 1-15) that the cap layer may have the thickness described in the claims since the thickness of any sublayer may be 5 Angstroms (equal to 0.5 nm).

In re claim 34, Jeon shows (fig. 1) that the silicon region comprises a silicon substrate (102), the conductive region comprises a gate electrode (108), and said insulating film is a gate insulating film (110). Jeon does not specifically disclose the characteristics of the insulator. The insulator of Jeon would inherently have the same properties as the instant invention since the materials and structure are the same as the instant invention.

In re claims 35-37, Jeon shows (fig. 1) said insulating film structure comprises said silicate region composed of a silicon oxide containing said at least one metal element, and a silicon oxide region composed of a silicon oxide not containing a metal element. The physical film thickness of said insulating film structure 3.5 nm or less since Jeon discloses that the film layer may have a thickness of 20 Angstroms (equal to 2.0 nm). The physical thickness of said silicate region is thinner than the physical thickness of said silicon oxide region since the individual layers may each have any thickness as desired (col. 16, lines 1-15). Jeon also discloses (col. 16, lines 1-15) that the silicate region may have the thickness less than 1.5nm described in the claims since the thickness of any sublayer may be 5 Angstroms (equal to 0.5 nm).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-9 and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeon et al. (US 6,586,349) as applied to claim 1 above.

In re claims 3-9 and 27-29, Jeon shows all of the elements of the claim except the specified parameters of the claims. It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the device parameters such as the concentration distribution and composition modulation having the desired values ,

since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jeon et al. (US 6,586,349) as applied to claim 1 above, and further in view of Green et al. (US Pub. 2003/0219972 A).

In re claim 30, Jeon shows all of the elements of the claims except the silicon oxide constituting the at least one silicate region being an oxynitride, which Green et al. discloses [0006] as a well known material in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the silicate of Jeon by using a oxynitride as taught by Green to provide a well known, alternative insulating material.

Response to Arguments

Applicant's arguments filed with respect to the rejection over Jeon have been fully considered but they are not persuasive. The applicant primarily argues that Jeon does not show all of the elements of the claims, specifically that Jeon does not disclose an insulating film structure containing at least one metal element thermally diffused. The examiner believes that the cited prior art references show all of the elements of the claims. The applicant is trying to differentiate Jeon's composite dielectric material

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layers from the insulation film of the claimed invention, however, the "term insulation film structure" is a broad term that does not require the film to be a single layer of insulating material. Therefore, Jeon's composite dielectric material layers satisfy what would be considered an insulating film structure since the dielectric material layer are an insulating film. Furthermore, as stated in the rejection above, Jeon discloses (col. 10, line 58- col. 11, line 5) that the dielectric material layer comprises a silicate region that includes a hafnium metal oxide material. The applicant has not argued why the limitation of the metal element being thermally diffused is patentably distinguishable over Jeon because the applicant has not argued the merits of the limitation itself. The applicant has only attempted to circumvent the "product by process" rejection by stating that Jeon does not even disclose the silicate region composed of a metal element, when in fact Jeon discloses the limitations in question. The limitation of the metal element being thermally diffused still does not overcome the reference and the rejection is still proper. For these reasons, this action is made final.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (571) 272-1737. The examiner can normally be reached on Mon-Thur and alternating Fri 9:00-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew E Warren/
Primary Examiner, Art Unit 2815

April 28, 2008